

REMARKS

The Office Action dated November 6, 2003, has been received and reviewed.

Claims 1-27 and 29-69 are currently pending in the above-referenced application.

Claims 1-22 and 65-69 were withdrawn from consideration as being drawn to a nonelected group following a restriction requirement in the above-referenced application. Each of claims 1-22 and 65-69 has been canceled without prejudice or disclaimer.

Claims 23-27, 29-35, 40-51, and 53-64, which have been considered, stand rejected.

No grounds for rejecting claims 36-39, which remain pending and under consideration in the above-referenced application, have been provided.

Each of claims 23-27 and 29-64 has been amended to either remove the term “said” or replace the term “said” with “the.” As these revisions merely constitute removal of an extraneous term or replacement of a term with an equivalent term, they do not narrow the scope of any of claims 23-27 or 29-64. Other claim revisions are discussed in detail hereinafter.

Reconsideration of the above-referenced application is respectfully requested.

Rejections Under 35 U.S.C. § 112, Second Paragraph

Claims 23 and 45 stand rejected under 35 U.S.C. § 112, second paragraph, for assertedly being indefinite.

Claims 23 and 45 have both been rejected for reciting that a back side of a second semiconductor device is “stably supported” by discrete conductive elements that extend at least partially over an underlying first semiconductor device. Thus, it appears that the Office intended to reject claims 23 and 45 under the *first paragraph* of section 112 rather than the second paragraph thereof. It is respectfully submitted that paragraph [0015] of the originally-filed specification provides support for the recitation that the first semiconductor device is “stably supported” by underlying discrete conductive elements:

The second semiconductor device is positioned over the first semiconductor device, resting on and *supported collectively by the discrete conductive elements* that electrically connect bond pads of the first semiconductor device to their corresponding contact areas of the substrate. (Emphasis supplied)

In any event, independent claims 23 and 45 have been amended to replace the phrase “stably supported” with “supported collectively,” which appears (as “collectively supported”) in the as-filed specification and which, in the context of the subject matter to which independent claims 23 and 45 are drawn, is actually broader than the term “stably.” Thus, these revisions do not narrow the scope of either independent claims 23 or independent claim 45.

Independent claim 45 was also rejected because “[t]here is insufficient antecedent basis for” the recitation “positioning a *second semiconductor device*...” therein. As the recitation “a second semiconductor device” positively sets forth a claim element that was not previously set forth in the claim, the asserted lack of antecedent basis and the accompanying rejection are not understood.

For these reasons, withdrawal of the 35 U.S.C. § 112, first and second paragraph, rejections of claims 23 and 45 is respectfully requested.

Rejections Under 35 U.S.C. § 103(a)

Claims 23-27, 29-35, 40-51, and 53-64 stand rejected under 35 U.S.C. § 103(a).

The standard for establishing and maintaining a rejection under 35 U.S.C. § 103(a) is set forth in M.P.E.P. § 706.02(j), which provides:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Wu

Claims 23, 24, 29, 30, 33, 40, 45, 46, 49, 50, 53, 59, and 61-64 stand rejected under 35 U.S.C. § 103(a) for being drawn to subject matter which is purportedly unpatentable over the teachings of U.S. Patent 6,400,007 to Wu et al. (hereinafter “Wu”).

Wu teaches stacked semiconductor device assemblies, as well as assembly methods.

An assembly according to Wu, shown in FIG. 4 thereof, includes a substrate 26 and a first semiconductor die 28 secured to substrate 26 with glue 30, 50. *See also* col. 3, lines 15-18. A projecting element 52 on substrate 26 causes glue 50 to extend upwardly beyond an active surface 46 of first semiconductor die 28. Col. 3, lines 18-26. Wires 32 electrically connect bonding pads 48 of first semiconductor die 28 to corresponding signal input terminals 40 of substrate 26. Col. 3, lines 30-32. An element identified in FIGs. 3 and 4 of Wu as “54” is positioned on active surface 46 of first semiconductor die 28, between two rows of bonding pads 48. *See also* col. 3, lines 36-40. Element “54” appears to support a second semiconductor die 34, which is positioned over first semiconductor die 28. *Id.*

In assembling these components, glue 50 is applied to a surface of substrate 26, within the confines of projecting element 52. Col. 3, lines 18-26. A backside of first semiconductor die 28 is brought into contact with glue 50. Col. 3, lines 15-18. As first semiconductor die 28 is biased toward substrate 26, glue 50 oozes upwardly, around the peripheral edges of first semiconductor die 28, and onto peripheral portions of active surface 46 thereof. Col. 3, lines 18-26. Next, wires 32 are formed between bonding pads 48 of first semiconductor die 28 and corresponding signal input terminals 40 of substrate 26. Col. 3, lines 30-32. Thereafter, second semiconductor die 34 is positioned over first semiconductor die 28 and on element “54,” which is apparently the “adhered glue 50” mentioned at col. 3, lines 36-40.

Although Wu teaches that wires 32 may be “pressed” by second semiconductor die 34, Wu does not include any teaching or suggestion that second semiconductor die 34 is “supported collectively” by wires 32.

It is respectfully submitted that a *prima facie* case of obviousness has not been established against any of claims 23, 24, 29, 30, 33, 40, 45, 46, 49, 50, 53, 59, or 61-64 because Wu does not teach or suggest each and every element of any of these claims.

Independent claim 23 is drawn to a method that includes, among other things, “positioning a second semiconductor device at least partially over [a] first semiconductor device [with] a back side of the second semiconductor device contacting at least some . . . discrete conductive elements and being supported collectively thereby.”

Again, Wu lacks any teaching or suggestion that wires 32 may collectively support second semiconductor die 34.

Thus, Wu does not teach or suggest this element of independent claim 23, and a *prima facie* case of obviousness under 35 U.S.C. § 103(a) has not been set forth against independent claim 23.

Claims 24, 29, 30, 33, and 40 are each allowable, among other reasons, for depending either directly or indirectly from claim 23, which is allowable.

Claim 24 is further allowable because Wu neither teaches nor suggests positioning second semiconductor die 34 thereof over wires 32 with a back side of semiconductor die 34 and wires 32 “in mutual electrical isolation.”

Claim 30 is additionally allowable since Wu lacks any teaching or suggestion of “drawing” second semiconductor die 34 thereof toward first semiconductor die 28. Instead, the teachings of Wu are limited to “stack[ing]” second semiconductor die 34 above first semiconductor die 28.

Claim 33 is also allowable since Wu does not teach or suggest that a quantity of adhesive material (element 54) is applied to an active surface of first semiconductor die 28 “after . . . positioning the second semiconductor” die 34 thereover.

Independent claim 45 is drawn to a method for assembling semiconductor devices in stacked arrangement. The method of independent claim 45 includes, among other things, “positioning a second semiconductor device at least partially over [a] first semiconductor device and on at least some discrete conductive elements . . . such that the second semiconductor device is supported collectively by the at least some discrete conductive elements . . .” Additionally, independent claim 45 recites that “the back side and . . . [the] discrete conductive elements” that support the back side “are electrically isolated from each other.”

As noted previously herein, Wu does not teach or suggest that second semiconductor die 34 thereof may be supported collectively by wires 32. Moreover, Wu lacks any teaching or suggestion that a back side of second semiconductor die 34 is “electrically isolated from” wires 32.

Therefore, it is respectfully submitted that Wu does not support a *prima facie* case of obviousness against independent claim 45. Thus, under 35 U.S.C. § 103(a), independent claim 45 recites subject matter which is allowable over that taught in Wu.

Each of claims 46, 49, 50, 53, 59, and 61-64 is allowable, among other reasons, for depending either directly or indirectly from claim 45, which is allowable.

Claim 46 is additionally allowable because Wu includes no teaching or suggestion of positioning second semiconductor die 34 thereof over wires 32 with a back side of second semiconductor die 34 “electrically isolated from” wires 32.

Claim 50 is further allowable since Wu lacks any teaching or suggestion of “drawing” second semiconductor die 34 thereof toward first semiconductor die 28. Instead, the teachings of Wu are limited to “stack[ing]” second semiconductor die 34 above first semiconductor die 28.

Claim 53 is also allowable since Wu does not teach or suggest that a quantity of adhesive material (element 54) is applied to an active surface of first semiconductor die 28 “after . . . positioning the second semiconductor” die 34 thereover.

Wu in View of Lee

Claims 25, 26, 31, 34, 35, 41-44, 47, 51, 54-58, and 60 stand rejected under 35 U.S.C. § 103(a) for reciting subject matter which is assertedly unpatentable over teachings of Wu, in view of the subject matter taught in U.S. Patent 6,388,313 to Lee et al. (hereinafter “Lee”).

The teachings of Wu have been summarized above.

Lee teaches a process for forming a multi-chip module. That process includes, among other things, securing a first semiconductor chip 21 to a substrate 20. FIG. 1; col. 5, lines 5-7. Bond pads 210 of first semiconductor chip 21 are electrically connected to corresponding terminals (not shown) of substrate 20 by bond wires 22. FIG. 1; col. 5, lines 7-10. A so-called “reverse wire-bonding technique” is employed so as to minimize the distance that bond wires 22 protrude above the active surface of first semiconductor chip 21. Col. 5, lines 10-21. Next, an electrically insulative adhesive layer 23 is applied over first semiconductor chip 21. FIG. 1; col. 5, lines 22-25. The adhesive layer completely surrounds bond wires 22. FIG. 1; col. 5,

lines 25-32. A second semiconductor chip 24 is then positioned over first semiconductor chip 21 and secured thereto by way of adhesive layer 23. *Id.*

Claims 25, 26, 31, 34, 35, and 41-44 are each allowable, among other reasons, for depending indirectly from claim 23, which is allowable.

Claim 31 is additionally allowable since Wu and Lee both lack any teaching or suggestion that the adhesive materials or resins disclosed therein are capable of drawing two semiconductor devices toward one another “by at least one of capillary action . . . , curing . . . , application of heat . . . , and vibration.”

Claim 34 is further allowable because neither Wu nor Lee teaches or suggests that two semiconductor device may be drawn toward one another.

Claim 35, which depends from claim 34, is also allowable since Wu and Lee do not teach or suggest that curing of a glue, resin, or other adhesive material may cause two semiconductor devices to be drawn toward one another.

Each of claims 47, 51, 54-58, and 60 is allowable, among other reasons, for depending indirectly from claim 45, which is allowable.

Claim 51 is additionally allowable since Wu and Lee both lack any teaching or suggestion that the adhesive materials or resins disclosed therein are capable of drawing two semiconductor devices toward one another “by at least one of capillary action . . . , curing . . . , application of heat . . . , and vibration.”

Claim 54 is further allowable because neither Wu nor Lee teaches or suggests that two semiconductor device may be drawn toward one another.

Claim 55, which depends from claim 54, is also allowable since Wu and Lee do not teach or suggest that curing of a glue, resin, or other adhesive material may cause two semiconductor devices to be drawn toward one another.

Claim 57 is additionally allowable because Wu and Lee both lack any teaching or suggestion of controlling biasing of one semiconductor device toward another.

Claim 58 is also allowable since neither Wu nor Lee includes any teaching or suggestion of “controlling biasing force to a level insufficient to deform, kink, bend, or collapse . . . discrete

conductive elements.” Wu actually teaches away from the subject matter recited in claim 58 by teaching the use of a projecting element 52 and overflow glue 58 to prevent shorting of wires 32 against first semiconductor die 28 as second semiconductor die 34 presses wires 32. Col. 3, lines 50-62.

Wu in View of Shim

Claims 27, 32, and 48 stand rejected under 35 U.S.C. § 103(a) for being directed to subject matter which is purportedly unpatentable over teachings from Wu, in view of the teachings of U.S. Patent 6,531,784 to Shim et al. (hereinafter “Shim”).

Claims 27 and 32 are both allowable, among other reasons, for depending indirectly from claim 23, which is allowable.

Claim 48 is allowable, among other reasons, for depending indirectly from claim 45, which is allowable.

In view of the foregoing, withdrawal of the 35 U.S.C. § 103(a) rejections of claims 23-27, 29-35, 40-51, and 53-64 is respectfully solicited.

Allowable Subject Matter

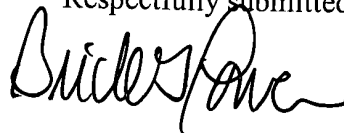
No grounds of rejection have been set forth against any of claims 36-39 or 52. Accordingly, each of these claims is believed to recite allowable subject matter.

If the Office does not consider any of these claims to be allowable, the issuance of another, nonfinal Office Action on the merits with explanations of the grounds for rejecting these claims is respectfully solicited.

CONCLUSION

It is respectfully submitted that each of claims 23-27 and 29-64 is allowable. An early notice of the allowability of each of these claims is respectfully solicited, as is an indication that the above-referenced application has been passed for issuance. If any issues preventing allowance of the above-referenced application remain which might be resolved by way of a telephone conference, the Office is kindly invited to contact the undersigned attorney.

Respectfully submitted,



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